



Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381

October 21, 2016

10 CFR 50.73

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Watts Bar Nuclear Plant, Unit 2
Facility Operating License No. NPF-96
NRC Docket No. 50-391

Subject: **Licensee Event Report 391/2016-007-00, Manual Reactor Trip Due to Loss of Main Feedwater**

This submittal provides Licensee Event Report (LER) 391/2016-007-00. This LER provides details concerning a recent event where the plant was manually tripped when the operating main feedwater pump turbine governor valve failed partially closed, resulting in reduced main feedwater flow. This report is being submitted in accordance with 10 CFR 50.73(a)(2)(iv)(A).

There are no regulatory commitments contained in this letter. Please direct any questions concerning this matter to Gordon Arent, WBN Licensing Director, at (423) 365-2004.

Respectfully,

A handwritten signature in black ink, appearing to read "Paul Simmons", is written over a horizontal line.

Paul Simmons
Site Vice President
Watts Bar Nuclear Plant

Enclosure
cc: See Page 2

U.S. Nuclear Regulatory Commission

Page 2

October 21, 2016

cc (Enclosure):

NRC Regional Administrator - Region II

NRC Senior Resident Inspector - Watts Bar Nuclear Plant



LICENSEE EVENT REPORT (LER)

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1. FACILITY NAME

Watts Bar Nuclear Plant, Unit 2

2. DOCKET NUMBER

05000391

3. PAGE

1 OF 5

4. TITLE

Manual Reactor Trip Due to Loss of Main Feedwater

5. EVENT DATE

MONTH	DAY	YEAR
08	23	2016

6. LER NUMBER

YEAR	SEQUENTIAL NUMBER	REV NO.
2016	- 007	- 00

7. REPORT DATE

MONTH	DAY	YEAR
10	21	2016

8. OTHER FACILITIES INVOLVED

FACILITY NAME	DOCKET NUMBER
N/A	N/A
FACILITY NAME	DOCKET NUMBER
N/A	N/A

9. OPERATING MODE

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

1

<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)

10. POWER LEVEL

48

<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)
	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT

Dean Baker, Licensing Engineer

TELEPHONE NUMBER (Include Area Code)

423-452-4589

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
A	SJ	P	Byron Jackson	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On August 23, 2016, at 1356 Eastern Daylight Time (EDT), during power ascension testing, Watts Bar Nuclear Plant (WBN) Unit 2 reactor was manually tripped due to a loss of main feedwater. Concurrent with the reactor trip, the Auxiliary Feedwater system actuated as designed. All control and shutdown rods fully inserted. All safety systems responded as designed.

The loss of main feedwater was due to a leak on a hydraulic fitting associated with the Main Feedwater Pump Turbine High Pressure Governor valve, resulting in the valve going partially closed with reactor power at 48 percent. With the governor valve partially closed, feedwater flow was reduced such that the unit needed to be manually tripped. Subsequent investigation determined the leak to be caused by the installation of incompatible fittings associated with the governor valve that occurred during plant construction.



LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
Watts Bar Nuclear Plant, Unit 2	05000391	YEAR	SEQUENTIAL NUMBER	REV NO.
		2016	- 007	- 00

NARRATIVE

I. PLANT OPERATING CONDITIONS BEFORE THE EVENT

Watts Bar Nuclear Plant (WBN) Unit 2 was in Mode 1 at 48 percent Rated Thermal Power (RTP) .

II. DESCRIPTION OF EVENT

A. Event

On August 23, 2016, at 1356 Eastern Daylight Time (EDT), WBN Unit 2 reactor was manually tripped due to a loss of main feedwater {EII:SJ} from the 2A Main Feedwater Pump (MFP) {EII:P}. Concurrent with the reactor trip, the Auxiliary Feedwater (AFW) system actuated as designed. All control and shutdown rods fully inserted. All safety systems responded as designed.

This event is being reported to the Nuclear Regulatory Commission (NRC) under 10 CFR 50.73(a)(2)(iv)(A) as a manual actuation of the reactor protection system and as an automatic actuation of the AFW system.

B. Inoperable Structures, Components, or Systems that Contributed to the Event

No inoperable systems contributed to the event.

C. Dates and Approximate Times of Occurrences

Date	Time (EDT)	Event
8/23/16	1352	2A MFP turbine speed decreases from 4543 to 3848 revolutions per minute (RPM)
	1352	Steam Generator (SG) levels start to decrease from 49 percent narrow range
	1356	Unit 2 manual reactor trip due to loss of Main Feedwater from 2A MFP when SG levels lowered to approximately 20 percent.
	1357	Operations enters 2-E-0, Reactor Trip or Safety Injection
	1402	Auxiliary operators report all AFW pumps started and are within expected parameters.
	1406	Operations transition to 2-ES-0.1, Reactor Trip Response

D. Manufacturer and Model Number of Components that Failed

A fitting associated with the 2A MFP turbine governor valve leaked excessively, resulting in the plant trip. The MFP and turbine are a Model HDR manufactured by Byron Jackson.

E. Other Systems or Secondary Functions Affected

No other safety systems were affected by this event.

F. Method of discovery of each Component or System Failure or Procedural Error

The failed hydraulic fitting was found during the post trip investigation of this event.

NRC FORM 366A
(11-2015)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104

EXPIRES: 10/31/2018



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G. Failure Mode and Effect of Each Failed Component

The use of incompatible hydraulic fittings led to the event.

H. Operator Actions

Operations personnel identified the reduced main feedwater flow and set a manual trip trigger point of 20 percent SG water level. When this limit was approached, operations personnel manually tripped the plant. The subsequent recovery and response to the trip were uncomplicated.

I. Automatically and Manually Initiated Safety System Responses

Operations personnel manually initiated the reactor protection system. Concurrent with the reactor trip, the AFW system automatically actuated as designed.

III. CAUSE OF THE EVENT

A. The cause of each component or system failure or personnel error, if known.

This event was the result of an incompatible fitting being used in the hydraulic controls for the 2A MFP turbine governor valve.

B. The cause(s) and circumstances for each human performance related root cause.

The cause was determined to be a human performance error during the assembly of the 2A MFP control hose connections. The hose connection was assembled incorrectly during the Nuclear Construction work to bring the 2A MFP turbine from an unused layup condition to a condition that was ready for operation as a part of WBN Unit 2 construction. This connection is not visible because it is inside the MFP turbine's oil return system. Therefore this misconfigured connection could not have been identified by the system turnover processes. The connection also functioned correctly during Preoperational testing and for a short time during Power Ascension testing so that there were no adverse indications as precursors to the event.

IV. ANALYSIS OF THE EVENT

WBN Unit 2 was operating at approximately 48 percent power based on power range instrumentation when the 2A MFP governor valve started to close. This was caused by an incorrect hydraulic fitting installation that used a female fitting with a 37-degree flare seating service connected to a standard pipe nipple which is not intended to mate with a 37-degree seating surface. Over time the fitting loosened and the fitting began to leak excessively. Operations personnel identified the degrading main feedwater flow and established a trigger value for a manual trip of 20 percent SG water level. Following the manual trip, operations personnel progressed promptly through their trip response procedures and stabilized the plant.

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V. ASSESSMENT OF SAFETY CONSEQUENCES

The loss of the 2A MFP led to a situation where operations personnel manually tripped the plant. The trip response and recovery were uncomplicated, and all safety systems operated as expected. The safety significance of this event was determined to be low.

- A. Availability of systems or components that could have performed the same function as the components and systems that failed during the event

No safety systems failed during this event.

- B. For events that occurred when the reactor was shut down, availability of systems or components needed to shutdown the reactor and maintain safe shutdown conditions, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident

Not applicable.

- C. For failure that rendered a train of a safety system inoperable, an estimate of the elapsed time from the discovery of the failure until the train was returned to service

Not applicable.

VI. CORRECTIVE ACTIONS

This event was entered into the Tennessee Valley Authority (TVA) Corrective Action Program and is being tracked under condition report (CR) 1206191.

- A. Immediate Corrective Actions

The incompatible fittings were replaced with the correct fittings for the application.

- B. Corrective Actions to Prevent Recurrence

Similar connections of both MFPs were inspected to confirm that no similar conditions existed. This event is being evaluated for inclusion in maintenance training related to pressure retaining connections.

VII. ADDITIONAL INFORMATION

- A. Previous similar events at the same plant

In LER 391-2016-005-00, Watts Bar reported a trip of the 2B MFP when the 2B MFP turbine condenser lost vacuum. The loss of the 2B MFP led to an automatic reactor trip on low SG water level. While this earlier event involved a MFP trip, it was caused by operator error when draining the 2A MFP turbine condenser, which is unrelated to this event.

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NARRATIVE

B. Additional Information

None.

C. Safety System Functional Failure Consideration

This condition did not result in a safety system functional failure.

D. Scrams with Complications Consideration

This reactor trip was determined to be uncomplicated.

VIII. COMMITMENTS

None.